

Systematic census of RR Lyrae in cluster vs. tails of stellar streams with an associated cluster

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We present first results of a systematic census of RR Lyrae in stellar streams with an associated cluster. Out of 16 stellar streams studied, we found 6 with more than 2 RR Lyrae in the tails. Of those, none present an RR-Lyrae type segregation as the one previously observed in Pal 5's stellar stream. However, the M92 stream may present a metallicity segregation where the RR Ly.

Galaxies like ours have formed gradually, progressively assimilating smaller galaxies. These accretion events have left fossil records, an important part of these are the globular clusters and stellar streams present in the Galactic halo. Studies have revealed that a large number of globular clusters fell into the Milky Way along with their respective host galaxies. But, these are only the “surviving” clusters. During the accretion process, clusters and dwarf galaxies can be disrupted in the halo thanks to tidal forces, generating stellar streams.

Our general aim is to search for RR-Lyrae (RRL) associated with all known stellar streams. The RRL are horizontal branch pulsating stars known for being standard candles, in this way, we can obtain precise distances of the stars being able to determine the distance gradient of the stellar stream. This will be needed to determine its dynamic properties.

In a first exploration for the Pal5 stellar stream 10 RRL were found in the cluster and 17 in the tails (Price-Whelan et al., 2019); in the M68-Fjorm stream the opposite is found, while there are over 40 RRL in the cluster, only less than a handful are found in the tails. Furthermore, in the case of Pal5 the RRL are segregated: The majority of the RRc (8/12) are in the cluster while the majority of the RRab (13/15) are in the tails (Price-Whelan et al., 2019).

We studied 16 stellar streams with an associated cluster using the union of GaiaDR3, PS1, ASAS-SN-II, ZTF, and OGLE RRL catalogs; and the sky, distance and proper motion tracks from galstreams library (Mateu, 2023) taken as “truth”. Members are found using a probabilistic model

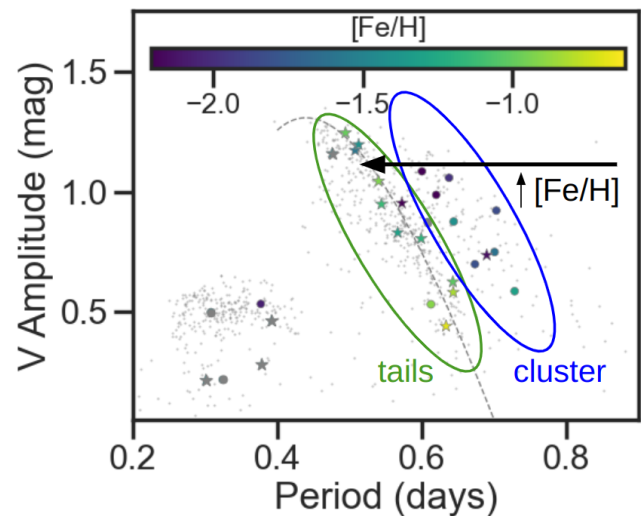


Figure 1. Period-amplitude diagram of the RRL from M92 stellar stream. Star symbols are the RRL of the tails and circle symbols are the RRL of the cluster. The color indicates the spectroscopic metallicity of the star measured by Gaia.

in distance and proper motion following Price-Whelan et al. (2019) and Foreman-Mackey et al. (2014).

After systematic census, only 6/16 of the stellar streams present several (> 2) RRL in the tails/total: NGC 2808 (22/29), M92 (16/29), Pal5 (15/24), NGC 1851 (6/17), NGC 3201 (5/90), Tucana III (5/5). These are the ones truly worthy to do the complete inference without assuming the distance and proper motion tracks.

None of them present a RRL type segregation as Pal5, but M92 present a metallicity segregation: tails metallicity (~ -1.5) $>$ cluster metallicity (~ -2.2) (see Fig. 1). This means a mixed population is less metal-rich in the inner part, and it could imply that M92 is a globular cluster and the tails are its disrupted host dwarf galaxy.

■ References

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